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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/553,971
Filing Date: November 08, 2005
Appellant(s): WESTMIJZE ET AL.

Willem F.C. de Weerd
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 6 December 2010 appealing from the Office action mailed 2 July 2010.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

Claims 1-12 are pending and rejected.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

JP 07-082304	Amano	3-1995
6,274,690	Hoshida	8-2001
6,384,155	Van Swieten	5-2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-8, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1995-082304 (herein "Amano"). The computer-generated English translation of Amano attached to the Office action mailed on 5 January 2010 is referred to herein.

As to claim 1: Amano discloses a process to polymerize one or more monomers using an amount of initiator that does not cause an uncontrolled reaction (for example, see paragraph 11) and a second initiator having a half-life of 0.1 hours at the reaction temperature (see isobutyryl peroxide in paragraph 10; and see the reaction temperature of 57 °C in paragraph 21), wherein the second initiator is dosed at least partially in between the start of the polymerization until 60% (preferably 50%) of the monomer has been polymerized (see paragraph 11). Amano further gives an example in which the second initiator is dosed when 15% of the monomer has been polymerized (see paragraphs 14 and 22).

Amano fails (1) to specifically name that at most 90% of a safely useable amount of a first initiator is used. Amano further fails (2) to specifically name a process in which the second initiator is dosed at least partially in between the start of the polymerization until 10% of the monomer has been polymerized. Amano further fails (3) to specifically name a process in which at least 92% of the maximum cooling capacity is used during a period of time in which at least 10 wt% of the monomer is polymerized.

However, it is noted that Amano teaches that a reflux condenser is used to prevent the reaction from exceeding a desired temperature (see paragraph 9). It is therefore evident that the operator may adjust the coolant flow through the condenser in

order to achieve a desired cooling capacity for the reactor to prevent the reaction from exceeding a desired temperature. Therefore, a person of ordinary skill would have been motivated to use a minimum amount of coolant, including an amount such as at least 92% of the cooling capacity of the reactor is used, in order to avoid wasting the energy necessary to cool any excess coolant in the condenser system.

Similarly, Amano recognizes that the condenser is in operation prior to dosing the very reactive initiator in order to prevent the reaction from exceeding a desired temperature (see paragraph 11). Therefore, a person of ordinary skill would recognize that the very reactive initiator may cause a considerable exotherm. Therefore, a person of ordinary skill would have been motivated to use an appropriate amount of the initiators to prevent the reaction from exceeding a desired temperature.

Amano further teaches that the second (very reactive) initiator is used in order to shorten the reaction time (see paragraph 11). Therefore, a person of ordinary skill would recognize that adding the second initiator at an earlier time in the process of Amano would further shorten the reaction time. Therefore, a person of ordinary skill would have been motivated to add the second initiator earlier in the process, including up to the point that 10% of the monomer has been polymerized, so as to further shorten the reaction time.

Additionally, Amano recognizes that the second initiator may be added at various points in the polymerization process, such as up to 50% monomer conversion, and further gives an example in which the second initiator is added at 15% monomer conversion. In view of this, a person of ordinary skill would recognize that the point at

which the second initiator is added may be optimized to achieve desired results. It is the examiner's position that the point of commencement and the duration of the initiator feed are result effective variables because changing them will affect the type of product obtained, including the resulting polymer's physical properties such as molecular weight, molecular weight distribution, and processability characteristics. Case law holds that "discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art." See MPEP 2144.05(II). In view of this, it would have been obvious to one of ordinary skill in the art to utilize an initiator feed with an appropriate point of commencement and the duration, including those within the scope of the present claims, so as to produce desired end results, thereby arriving at the presently claimed invention.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the present invention: (1) to have used an appropriate amount of initiators to prevent the reaction from exceeding a desired temperature, including at most 90 wt% of the safely useable amount of a first initiator, as is presently recited; (2) to have added the second initiator at an earlier time in the process, including during the time period in which the second initiator is dosed at least partially in between the start of the polymerization until 10% of the monomer has been polymerized so as to shorten the reaction time; and (3) to have used a minimum amount and flow rate of coolant to reduce the cost of the process, including using an amount such that at least 92% of the maximum cooling capacity is used during a period of time in which at least 10 wt% of the monomer is polymerized, thereby arriving at the presently claimed invention.

As to claims 2 and 3: Amano discloses a suspension polymerization of vinyl chloride (see claim 1).

As to claim 4: The second initiator is added continuously in the example in Amano (paragraph 21) until the point that the monomer conversion is 40%. At this stage in the polymerization process, the pressure will have started to drop.

As to claims 5 and 12: Amano further discloses the use of protective colloids, such as cellulose derivatives and polyvinyl alcohol (see paragraph 18).

As to claim 6: Amano discloses a first initiator having a half-life of 3.1 hours at the reaction temperature (e.g. see bis(2-ethylhexyl)peroxydicarbonate in paragraph 16; and see the reaction temperature of 57 °C in paragraph 21) and a second initiator having a half-life of 0.1 hours at the reaction temperature (e.g. see isobutyryl peroxide in paragraph 10).

As to claims 7 and 8: Amano further discloses that the second initiator may be used in an amount of 0.02 wt% based on the monomer (see paragraph 12), and that the first initiator may be used in an amount of 0.03 wt% based on the monomer (see paragraph 16), which amounts are within the presently recited ranges.

As to claim 11: The process of Amano is a batch suspension polymerization (see an example in paragraph 21); this process will necessarily show a pressure drop of the vinyl chloride as the monomer is consumed in the polymerization reaction.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Amano in view of US Patent No. 6,274,690 (herein "Hoshida").

The discussion with respect to Amano regarding claims 1 and 4 as set forth above is incorporated here by reference.

As to claim 9: As set forth above, Amano suggests the process of instant claims 1 and 4. Amano fails to specifically disclose a polymerization method using a reactor with a volume of 15 m³ or larger. However, it is within the ordinary skill in the art to scale up a known reaction. It is further known in the art to polymerize vinyl chloride in reactors with a volume of at least 15 m³. For example, Hoshida discloses a method of polymerizing vinyl chloride monomer with reactors of at least 40 m³ (see abstract). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the present invention to have scaled up the process suggested by Amano, including conducting the process with commercial-size reactor such as one of 15 m³ or larger volume as taught by Hoshida, thereby arriving at the presently claimed invention.

Claims 1-8 and 10-12 are rejected as being unpatentable over Amano in view of US Patent No. 6,384,155 (herein "Van Swieten").

As to claim 1: Amano discloses a process to polymerize one or more monomers using an amount of initiator that does not cause an uncontrolled reaction (for example, see paragraph 11) and a second initiator having a half-life of 0.1 hours at the reaction temperature (see isobutyryl peroxide in paragraph 10; and see the reaction temperature of 57 °C in paragraph 21), wherein the second initiator is dosed at least partially in between the start of the polymerization until 60% (preferably 50%) of the monomer has been polymerized (see paragraph 11). Amano further gives an example in which the

second initiator is dosed when 15% of the monomer has been polymerized (see paragraphs 14 and 22).

Amano fails (1) to specifically name that at most 90% of a safely useable amount of a first initiator is used. Amano further fails (2) to specifically name a process in which the second initiator is dosed at least partially in between the start of the polymerization until 10% of the monomer has been polymerized. Amano further fails (3) to specifically name a process in which at least 92% of the maximum cooling capacity is used during a period of time in which at least 10 wt% of the monomer is polymerized.

However, it is noted that Amano teaches that a reflux condenser is used to prevent the reaction from exceeding a desired temperature (see paragraph 9). It is therefore evident that the operator may adjust the coolant flow through the condenser in order to achieve a desired cooling capacity for the reactor to prevent the reaction from exceeding a desired temperature. Therefore, a person of ordinary skill would have been motivated to use a minimum amount of coolant, including an amount such as at least 92% of the cooling capacity of the reactor is used, in order to avoid wasting the energy necessary to cool any excess coolant in the condenser system.

Similarly, Amano recognizes that the condenser is in operation prior to dosing the very reactive initiator in order to prevent the reaction from exceeding a desired temperature (see paragraph 11). Therefore, a person of ordinary skill would recognize that the very reactive initiator may cause a considerable exotherm. Therefore, a person of ordinary skill would have been motivated to use an appropriate amount of the initiators to prevent the reaction from exceeding a desired temperature.

Amano further teaches that the second (very reactive) initiator is used in order to shorten the reaction time (see paragraph 11). Therefore, a person of ordinary skill would recognize that adding the second initiator at an earlier time in the process of Amano would further shorten the reaction time. Therefore, a person of ordinary skill would have been motivated to add the second initiator earlier in the process, including up to the point that 10% of the monomer has been polymerized, so as to further shorten the reaction time.

Additionally, Amano recognizes that the second initiator may be added at various points in the polymerization process, such as up to 50% monomer conversion, and further gives an example in which the second initiator is added at 15% monomer conversion. In view of this, a person of ordinary skill would recognize that the point at which the second initiator is added may be optimized to achieve desired results.

Van Swieten teaches that using a reactive peroxide (see col 2 lines 18-45) in the early stage of polymerization allows for fast heating up (see col 2 lines 60-62), and further teaches that dosing the peroxide allows for control of the polymerization rate (see col 2 lines 65-66). In view of Van Swieten, a person of ordinary skill would recognize that adding the second initiator of Amano earlier in the process would allow for faster heating up, thereby shortening the reaction time and increasing throughput of the reactor. Van Swieten further teaches (see col 2 line 14) that the process of Amano may lead to an undesirable amount of residual peroxide in the polymer. Therefore, a person of ordinary skill would have been motivated to optimize the relative proportion of the first (more stable) initiator and the second (less stable) initiator in the process of

Amano, including using less of the first and more of the second initiator, so as to minimize the amount of residual peroxide in the polymer.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the present invention: (1) to have used an appropriate amount of initiators to prevent the reaction from exceeding a desired temperature, including at most 90 wt% of the safely useable amount of a first initiator, as is presently recited; (2) to have added the second initiator at an earlier time in the process of Amano, including during the time period in which the second initiator is dosed at least partially in between the start of the polymerization until 10% of the monomer has been polymerized, as suggested by Van Swieten; (3) to have used a minimum amount and flow rate of coolant to reduce the cost of the process, including using an amount such that at least 92% of the maximum cooling capacity is used during a period of time in which at least 10 wt% of the monomer is polymerized; and (4) to have optimized the relative amounts of the two initiators so as to minimize the amount of residual peroxide in the polymer, as suggested by Van Swieten, thereby arriving at the presently claimed invention.

As to claims 2 and 3: Amano discloses a suspension polymerization of vinyl chloride (see claim 1). Van Swieten also discloses a suspension polymerization of vinyl chloride (see col 4 lines 11 and 25).

As to claim 4: The second initiator is added continuously in the example in Amano (paragraphs 21-22) until the point that the monomer conversion is 40%. At this stage in the polymerization process, the pressure will started to drop.

As to claims 5 and 12: Amano further discloses the use of protective colloids, such as cellulose derivatives and polyvinyl alcohol (see paragraph 18). Van Swieten also discloses that the method disclosed therein may include the use of a protective colloid (see col 3 lines 53-55).

As to claim 6: Amano discloses a first initiator having a half-life of 3.1 hours at the reaction temperature (e.g. see bis(2-ethylhexyl)peroxydicarbonate in paragraph 16; and see the reaction temperature of 57 °C in paragraph 21) and a second initiator having a half-life of 0.1 hours at the reaction temperature (e.g. see isobutyryl peroxide in paragraph 10).

As to claims 7 and 8: Amano further discloses that the second initiator may be used in an amount of 0.02 wt% based on the monomer (see paragraph 12), and that the first initiator may be used in an amount of 0.03 wt% based on the monomer (see paragraph 16), which amounts are within the presently recited ranges.

As to claim 11: The process of Amano is a batch suspension polymerization (see an example in paragraph 21); this process will necessarily show a pressure drop of the vinyl chloride as the monomer is consumed in the polymerization reaction.

As to claim 10: Amano fails to specifically disclose variable dosing of the first initiator in a polymerization using two initiators. However, Van Swieten teaches generally that the initiators may be dosed continuously or discontinuously (see claim 1). It is within the ordinary level of skill in the art to adjust an initiator feed in response to reaction conditions, such as temperature, conversion, pressure, and the like. Therefore, it would have been obvious to a person of ordinary skill at the time of the present

invention to have adjusted the initiator feed in the method of Amano by dosing the first initiator at a variable rate as suggested by Van Swieten, thereby arriving at the presently claimed invention.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Amano in view of Van Swieten and Hoshida.

The discussion with respect to Amano and Van Swieten regarding claims 1 and 4 as set forth above is incorporated here by reference.

As to claim 9: As set forth above, Amano and Van Swieten suggest the process of instant claims 1 and 4. Amano and Van Swieten fail to specifically disclose a polymerization method using a reactor with a volume of 15 m^3 or larger. However, it is within the ordinary skill in the art to scale up a known reaction. It is further known in the art to polymerize vinyl chloride in reactors with a volume of at least 15 m^3 . For example, Hoshida discloses a method of polymerizing vinyl chloride monomer with reactors of at least 40 m^3 (see abstract). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the present invention to have scaled up the process suggested by Amano and Van Swieten, including conducting the process with commercial-size reactor such as one of 15 m^3 or larger volume as taught by Hoshida, thereby arriving at the presently claimed invention.

(10) Response to Argument

With regard to the rejections over Amano: Appellant argues (first paragraph on page 7 of Appeal Brief) that a skilled artisan would not be motivated to optimize the process of Amano, including varying the temperatures, cooling capacities, and initiator concentrations, because the skilled artisan would recognize that varying these variables "is very dangerous because these initiators decompose quickly and exothermically and just playing around with these parameters involves high risks of a run-away reaction." While the examiner concedes that arbitrary or impetuous variation of the parameters of the polymerization reaction may produce a run-away reaction, this sort of variation of reaction parameters ("just playing around") did not form the basis of the rejections over Amano. In particular and as will be discussed in greater detail below, Amano discloses the need for sufficient cooling capacity and the effects of the presence of too much initiator early in the reaction (potential insufficient cooling) or too much initiator late in the reaction (residue in the product leading to discoloration), thereby providing motivation to the skilled artisan to carefully optimize these parameters rather than merely "play around" with them.

Appellant further argues (first full paragraph on page 8 of Appeal Brief) that Amano discloses that the second (less temperature stable) initiator is added only after the polymerization reaction has reached 15% monomer conversion, whereas the present claims require addition within the first 10% of monomer conversion. Appellant cites paragraphs 11 and 14 of Amano to this effect. However, paragraph 11 of Amano teaches that the reflux condenser should be used in order to ensure sufficient cooling capacity and thereby avoid defects such as fish eyes in the resulting polymer. While

paragraph 11 teaches the need to control the addition of initiator based upon the cooling capacity, it does not limit the disclosed process to addition of the more reactive initiator only after monomer conversion has reached 15%. Rather, this portion of the reference teaches a requirement that the more reactive initiator not be added until the reflux condenser is in use in order to achieve sufficient cooling and to avoid defects in the resulting polymer, without any specific regard to the monomer conversion at the point the reflux condenser is started. The cited paragraph 11 of Amano does not provide any specific requirement or reasoning with regard to the addition of the second initiator only after 15% conversion, as argued by Appellant.

Appellant further argues (paragraph bridging pages 8-9 of Appeal Brief) that the process of Amano includes adding 100% of the safely useable amount of the first initiator, precluding the ability to add a second initiator before the reflux condenser is in use. Appellant refers to paragraph 4 to this effect. The examiner has considered paragraph 4 of Amano, but does not find therein support for Appellant's assertion that Amano adds 100% of the safely useable amount of the first initiator. However, Amano does teach (e.g. paragraphs 4-5) the well known relationship between the addition of initiator and the resulting heat of reaction from polymerization (i.e. that free radical polymerization is exothermic), and that a reflux condenser is used to ensure sufficient cooling capacity (e.g. paragraph 8). Therefore, *arguendo*, even if Appellant's assertion that the process of Amano includes adding 100% of the safely useable amount of the first initiator were correct, the disclosure by Amano of the addition of a certain amount of the first initiator would not detract from the skilled artisan's motivation to optimize the

amounts of the two initiators in order to ensure that the reactor operates with sufficient cooling capacity. This is also to say that, because Amano teaches that the addition of initiator results in heat of reaction from polymerization, a person of ordinary skill would be motivated to optimize the amount of initiator; the mere presence of a difference between the amount of initiator added in Amano and the amount presently claimed would not detract from a person of ordinary skill's motivation to optimize the amounts of initiators in the process of Amano. Additionally, because the process Amano includes the use of a second (less temperature stable) initiator, and because Amano teaches the need for sufficient cooling capacity to avoid defects in the polymer (e.g. paragraphs 4 and 11), it is evident that a skilled artisan would be motivated to use appropriate and safe amounts of the initiators to ensure that the reactor operates with sufficient cooling capacity and does not produce defects in the polymer.

Appellant further argues (first full paragraph on page 9 of Appeal Brief) that the present invention results less defects such as fish-eyes than the process of Amano. Appellant points to page 2 of the present specification. The cited portion of the specification does not contain any specific comparative evidence, and Appellant has not otherwise provided any specific comparative evidence in support of this assertion (see MPEP 716.01(c)(II)). Therefore, no unexpected improvement in the number defects such as fish-eyes can be attributed to the presently claimed invention based on the current record.

With regard to the rejections over Amano in view of Van Swieten, Appellant argues (second full paragraph on page 9 of Appeal Brief) that Van Swieten teaches not to use the first initiator of Amano by stating that the use of a more stable peroxide at the beginning the polymerization results in an unacceptably high residue of peroxide in the final polymer, and points to the comparative example of Van Swieten. It is noted from that Van Swieten teaches (e.g. column 2 lines 5-17) line that polymers produced with a more stable initiator may contain "unacceptable" amounts of residues from the initiators, and thereby show discoloration during processing. However, it is evident that the amount of these residues and the resulting discoloration is subjective, in that a person of ordinary skill would determine what amount is unacceptable based on the intended use of the final polymer product. Amano similarly teaches that the amount of initiator is correlated with discoloration during processing (e.g. see the end of paragraph 16), but does not disclose that the amount of discoloration or the amount of residual initiator is unacceptable. Therefore, a person of ordinary skill would be motivated by both references to adjust the amount of initiator to achieve an amount of residue from the initiator which is acceptable for a given intended use of the polymer. The fact that Van Swieten teaches the same correlation between the amount of initiator used in the polymerization and the discoloration of the polymer during processing that is taught in Amano does not amount to a teaching away from the process of Amano, or detract from a person of ordinary skill's motivation to optimize the amount of initiators in order to achieve an amount of residue from the initiator which is acceptable for a given intended use of the polymer.

Appellant further argues (bridging pages 9-10 of Appeal Brief) that adding the more reactive initiator of Amano earlier in the polymerization would result in an unsafe situation, and that faster heating up or addition of the second initiator within the first 15% of conversion is not permitted in the process of Amano. Appellant points to paragraphs 3 and 11 of Amano. It is firstly noted that paragraph 3 of Amano is a discussion of background information and problems which have occurred in the previous art. Amano teaches (see paragraph 4) that these problems are resolved by the disclosed invention, including using two initiators. Thus the discussion of paragraph 3 with regard to the use of an increased amount of the (more stable) initiator in the early stage of the reaction does not reflect the invention taught by Amano which is taught by Amano for alleviating this problem. It is evident that Amano discloses the use of two initiators, with the addition of the second (less stable) initiator in the early stage of the reaction alongside the use of a reflux condenser to provide sufficient cooling capacity, in order to remedy the problems discussed in paragraph 3.

Paragraph 11 of Amano teaches that the reflux condenser should be used in order to ensure sufficient cooling capacity and thereby avoid defects such as fish eyes in the polymer. While paragraph 11 teaches the need to control the addition of initiator based upon the cooling capacity, it does not limit the disclosed process to addition of the more reactive initiator only after monomer conversion has reached 15%, as Appellant has argued. Rather, this portion of the reference teaches a requirement that the more reactive initiator not be added until the reflux condenser is in use in order to achieve sufficient cooling and to avoid defects in the resulting polymer, without any

specific regard to the monomer conversion at the point the reflux condenser is started. The cited paragraph 11 of Amano does not provide any specific requirement or reasoning with regard to the addition of the second initiator only after 15% conversion, as argued by Appellant. While the addition of the more reactive initiator may produce an unsafe reaction if it is added without the use of a reflux condenser, Amano does not teach here that an unsafe situation would occur merely from the addition of the more reactive initiator prior to 15% conversion.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/RICHARD A HUHN/

Examiner, Art Unit 1764

/Vasu Jagannathan/
Supervisory Patent Examiner, Art Unit 1764

Conferees:

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